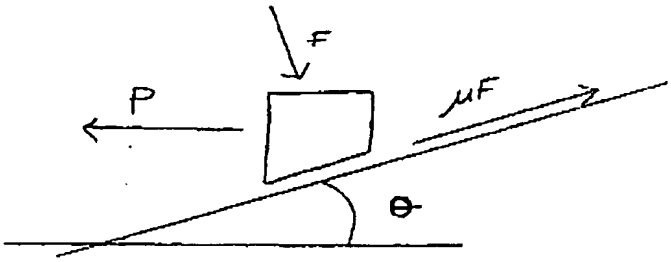
Appendix 1



If F is the force induced perpendicular to the surface by the hoop stress in the ring and P is the pull required to take the ring off, then the force due to friction resisting P is μF where μ is the coefficient of expansion.

$$P = \mu F\cos\theta + F\sin\theta$$

The limiting case for a self locking taper is when P=0

Therefore $\mu F\cos\theta = -F\sin\theta$

And $\mu = \sin\theta / \cos\theta = \tan\theta$

So if $\mu=0.25$, then $\theta=14°$

Consequently, for angles less than 14° the taper is not self locking; and for angles greater than 14° the taper is self-locking.

In practice, because the ring does not necessarily come off square the limiting angle for self locking is less than this.

NB $\mu=0.25$ is an acceptable value of μ between steel (which is what we make the ring from) and anything onto which the ring is likely to be mounted.